B3 cont'd

Claim 62. The method of claim 34, further comprising forming semicircular recesses in the teeth and disposing the teeth side by side so that the recesses are in confronting relationship thereby forming circular openings; and threadably locating the cable in the circular openings.--

REMARKS

This Amendment is in response to the Official Action of November 24, 1999, wherein the Examiner objected to the specification as not containing an Abstract. A new Abstract is set forth on a separate sheet attached hereto.

The Examiner also noted a spelling error, which has been corrected.

The Examiner noted that the Applicants have not submitted priority documents. It is believed that the Applicants are not required to submit priority documents, inasmuch as the application is based upon a PCT filing and the Receiving Office is required to forward the documents to the various designated states. Thus, it is believed that the priority requirements have been met.

The Examiner rejected certain claims under 35 USC 102(b), citing Huang et al., U.S. Patent No. 5,382,859.

The Examiner rejected certain claims under 35 USC 102(e), citing Takeuchi et al., U.S. Patent No. 5,583,387.

The Examiner rejected certain claims under 35 USC 103(a) as allegedly unpatentable over Huang, in view of Elton et al., U.S. Patent No. 5,036,165. Additionally, the Examiner cites Breitenbach, U.S. Patent No. 4,785,138, Rieber, U.S. Patent No. 4,607,183, Evans, U.S. Patent No. 2,244,443, Lasche, U.S. Patent No. 681,800, Beck, U.S. Patent No. 4,255,849.

In respect to the rejection of the claims under 35 USC 102(b) and 102(e), the amendments herein are believed to overcome the rejection. With respect to claim 1 and the rejected dependencies therefrom, the amended claim recites a structure having radially positioned recesses for receiving a cable including a current-carrying conductor and an electric field confining insulating covering

surrounding the conductor. Huang does not show such a structure. In particular, Huang has a radial slot with a conventional recess. The present invention has a number of positioned recesses which extend radially inward toward a would-be stator characterized in that each stator tooth is configured as a number of tooth sections for receiving the cable, which is further defined as having a magnetically permeable electric field confining insulating covering surrounding the conductor.

Likewise, the method of claim 34 and the rejected claims depending therefrom are believed to be fully obviated by the amendments herein. Takeuchi does not disclose the method. In Takeuchi T-shaped core pieces are stacked and welded together. The winding is wrapped around each stack of core pieces and the wound core pieces are assembled into a core which is welded. The core pieces have mating parts facilitating assembly.

In the present invention, the core is formed of four sections forming tooth planks which are assembled. Thereafter, a cable winding is threaded between the teeth confining the electric field in the winding as claimed. This is a fundamentally different process for making a different device.

The Examiner has rejected claims 3-8 over Huang, in view of Elton. According to the Examiner, Elton provides a winding with at least one current-carrying conductor, semiconducting layers and an insulating layer. The Examiner concludes that it would have been obvious to employ the cable from Elton into the stator of Huang et al. in order to prevent corrona discharge.

The Examiner has rejected certain claims as unpatentable over Huang, in view of Elton '165. According to the Examiner, Huang discloses the stator but does not disclose electric field confining winding employing a current-carrying conductor, first and second semiconducting layers and the solid insulation. However, the Examiner asserts that Elton supplies the particular element and thus it would be obvious to combine Elton and Huang.

Elton '165 describes a high voltage cable having an inner layer of semi-conducting pyrolyzed glass fiber material and an outer layer of the same material in which the outer layer is grounded. Once the teaching of Elton is fully

considered and viewed as a whole, it will be apparent that Elton does not show or suggest the invention alone or in combination with any of the references cited. Even though it is suggested in Elton to apply a semi-conducting layer in the form of a pyrolyzed glass tape to a winding in a dynamo-electric machine, and to apply such a layer in a power cable, there is no indication that the use of such a cable would be useful in a dynamo- electric machine. Indeed, the disclosure of Elton '165 stems from a parent U.S. Patent 4,835,565 which describes three different applications for a semi-conducting layer. One application is for using a pyrolyzed glass tape in a layer in conventional winding or armature bars in a known high current, low voltage dynamo-electric machine. A second application set forth in the parent of Elton '165 is for a housing to reduce electric discharge in an enclosed circuit. Finally, the parent of Elton '165 employs a semi-conducting pyrolyzed glass layer in a conventional cable. However, there is no proposal to use the cable shown in Elton '165 in a dynamo-electric machine. It is only the semi-conducting tape that is used in a dynamo-electric machine. The arrangement of Elton does not provide a solid insulating system as described and disclosed in the present invention.

It is clear that Elton describes the use of a semi-conducting layer as a grounding tape around conventional insulated electrical windings or armature bars which are disposed in the slots of a conventional machine. It should be emphasized that Elton '565 discusses the use of an insulated conductor in the winding of a dynamo-electric machine. Here, the conductor is a conventional rigid bar, not a cable. The Abstract of Elton '165 is identical to the Abstract of the parent which discloses in the specification three different and diverse applications for semi-conducting pyrolyzed glass fiber. Nowhere does the parent Elton et al. suggest that the cable described in the specification could be used for such purpose. The portion of the specification of Elton '165 noted by the Examiner discusses the conventional winding in the background but goes on to describe a high-voltage cable without suggesting that the cable could be used as the winding in the dynamo-electric machine. In view of the differences in operation between conventional armatures and windings that use pyrolyzed glass

tape and a power cable that also uses pyrolyzed glass tape, one of ordinary skill in the power generation art would not have been motivated at the time the invention was made to substitute the power cable for the winding since the prevailing thought at the time was that cable wound electric machines would not operate successfully at high voltage. Furthermore, Elton itself does not teach or suggest the substitution but merely provides yet another indication that those of ordinary skill in the power industry would recognize windings as being in a different field of endeavor than power cables. Elton merely describes that the pyroyzed glass tape may be used in these two different fields of endeavor, namely, windings in electric machines and also in power cables. Thus, it is believed that Elton '165 has no applicability to the arrangement described in the present invention.

There is no suggestion that the conventional winding of Elton '565 having a semiconducting grounding tape could be modified by substitution of the cable of the invention. The reference simply employs semi-conductive material in conventional machine winding and in a cable structure. Elton '165 does not disclose that it would be useful to use the cable as the winding. This is because, for a given power level $P=E \cdot I$, where P=power, E=voltage, and I=current, when the voltage is high the current is consequently low and vice-versa. As such, the conductor in a high voltage machine according to the invention can be flexible and have a relatively small cross section (as in a cable). Such conductor need not have a capability of carrying a high current. In a high power machine in which current is high and the voltage is relatively low, the conductors are formed of shaped, rigid, high cross-sectional area copper bars. The problems associated with high current operation typically involve thermal considerations, whereas at high voltage, insulation breakdown is a predominant failure mode. Thus, it is not obvious to combine an essentially high voltage device, such as a power cable in a high current device, such as a high power machine. It is not merely the fact that the voltage in one machine is much higher than the other, it is that the problems associated with high voltage operation are entirely different from problems associated with high current operation, and the focus of the designer is thus

entirely different. In an obviousness rejection, there must be some motivation to make the combination, not just that it was possible to do so.

The Examiner also rejected certain claims over Huang, in view of Elton, and further in view of Breitenbach et al. According to the Examiner, Breitenbach discloses two adjacent layers which have substantially the same expansion coefficient. The Examiner cites certain portions of Breitenbach in support of his argument. However, the portions cited do not specify that the materials have the same coefficient thermal expansion and, indeed, the inner conductive layer 7 and outer conductive layer 9 are the same material and the insulation layer 8 therebetween is a different material. There is nothing in Breitenbach to suggest that the thermal coefficient should be the same or any reason why that would be desirable.

It should also be understood that one skilled in the art would not employ the arrangement of Breitenbach in a high voltage machine as claimed in the present invention. The layered structure in Breitenbach would not operate properly in a high magnetic field associated with a high voltage machine, because eddy currents would be induced in the conductive jacket causing overheating, excessive electrical losses and ultimately cable failure. Breitenbach employs conductive layers separated by an insulation layer and surrounded by a conductive outer jacket. The jacket and insulation layers would trap heat at excessive layers in the confines of a high power machine. Further, the serpentine windings in Breitenbach would produce electric field peaks in the corners where the cable changes direction. Note, for example, the at column 4, lines 12-18, Breitenbach describes a strand of conductor of the cable as being soft and knealed and easily bent with only insignificant spring back. The cable is bent into sharp corners around small radii about 1.5 times the cable diameter. This is significant because Breitenbach teaches that sharp corner are permissible and acceptable. However, such sharp corners would concentrate the electric field thereat, which is unacceptable in high voltage machines according to the invention. This is because the highly concentrated electric field would result in unacceptably high electric field stress in the cable causing corrona discharge and cable failure. Thus,

Breitenbach does not recognize the problems associated with high voltage operations. Nothing in Breitenbach mentions what effect high voltage and high heat concentrations would do to the cable, because Breitenbach is not concerned with the problem.

The Examiner rejected certain claims as being unpatentable over Huang, in view of Rieber et al. According to the Examiner, Rieber provides a key element to prevent lateral oscillations of the tooth and aligning located in the notch. However, the wedge element in Rieber is provided for securing the conductor bars 16 in the radial slots. In the present invention, the circular openings in the slots maintain the winding in position. Further in Rieber, the slots are relatively shallow, as is common in conventional machines, whereas in the present invention, the slots are quite long, and lateral vibration, as opposed to the necessity of securing the bars in the slots becomes more important.

The Examiner rejected claims 27-29 over Huang et al., in view of Evans. According to the Examiner, Evans discloses compressing means for prestressing along the circumference of the core. It is respectfully submitted that Evans operates in the axial direction, as opposed to the circumferential direction. In the description of Evans, the various embodiments are designed to maintain the laminations together in the axial direction. In this connection, Fig. 1 shows a pair of hoops which are located at the opposite ends of the laminated stack forming the stator, and rib members are secure the rings together in the axial direction. The arrangement in Evans is not designed to circumferentially prestress the structure, but is designed to maintain the structure in the axial direction. In contrast, the present invention is arranged to circumferentially prestress the structure in order to urge the sections together so that forces extend in the radial direction thereby forming a self-supporting structure of individual tooth planks.

Lasche is simply a system for reshaping the laminated armature under its own weight. So-called clamping ring noted by the Examiner is the laminae ring, which is deformed from the weight of the ring itself. Thus, Lasche is designed to stress the ring and reshape it so that it becomes more circular. In addition, it appears that Lasche only operates at the ends of the stack, and not

about the stack as in the present invention. Thus, it is not seen how such diverse arrangements can be combined to form a circumferential ring which operates on the periphery of the laminations to prestress the structure. The arrangement envisioned by the Examiner cannot be utilized without significant modification of each of the references and even then may not achieve the desired result. The present invention employs a circumferential strap which is tightened to prestress the segments forming the stator. The arrangements envisioned by the Examiner operates on the ends of the device, as opposed to about the stator core.

The Examiner has rejected claims 25-26 over Huang, in view of Lasche and Beck et al. According to the Examiner, Beck discloses spring means associated with tightening means for adjusting thermal expansions and contractions of the winding. However, it should be understood that Beck et al. is directed to a superconducting winding formed of alternating layers of superconducting materials separated by an insulator and plurality of such structures separated by cooling ducts. It is not clear that there is any form of stator structure which is stabilized by a circumferential arrangement as set forth in the present invention.

The Examiner has also rejected the independent method claim under 35 USC 102(e) as allegedly anticipated by Takeuchi et al. However, as noted above, Takeuchi does not describe or illustrate the use of a high voltage cable in the machine as claimed. However, as noted above, it is believed that the power cable in Elton et al. is not for use in a high voltage machine, but is for an entirely different application, namely power cables. Thus, the combination as asserted by the Examiner is believed inapplicable.

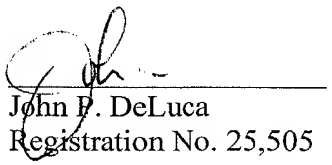
Likewise, the various combinations as asserted by the Examiner with respect to the secondary references are believed to be equally inapplicable to the rejections based upon Takeuchi et al. in combination therewith, and are thus not repeated.

In summary, none of the references, either alone or in combination, show an arrangement which does not suffer from at least one important defect, namely: the inability to confine the electric field; unacceptable field peaks; unacceptable

heat concentration, i.e., high cooling demand; excessive eddy currents; and too high or too low a resistivity of the inner and outer layers.

In view of the foregoing, it is respectfully requested that the Examiner reconsider his rejection of the claims, the allowance of which is earnestly solicited.

Respectfully submitted,



John P. DeLuca
Registration No. 25,505

WATSON COLE GRINDLE WATSON, P.L.L.C.
1400 K Street, N.W., 10TH Floor
Washington, D.C. 20005-2477
(202) 628-0088
JPD/er